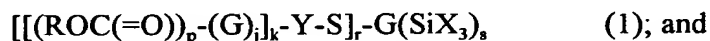


# BLOCKED MERCAPTOSILANE COUPLING AGENTS FOR FILLED RUBBERS

## ABSTRACT OF THE DISCLOSURE

Disclosed herein is a process of manufacturing a filled rubber comprising the steps of mixing a rubber, an inorganic filler, and a blocked mercaptosilane selected from the group consisting of:



wherein

Y is a polyvalent species  $(\text{Q})_z\text{A}(=\text{E})$  selected from the group consisting of  
 $-\text{C}(=\text{NR})-$ ;  $-\text{SC}(=\text{NR})-$ ;  $-\text{SC}(=\text{O})-$ ;  $-\text{OC}(=\text{O})-$ ;  $-\text{S}(=\text{O})-$ ;  $-\text{S}(=\text{O})_2-$ ;  $-\text{OS}(=\text{O})_2-$ ;  $(-\text{NR})\text{S}(=\text{O})_2-$ ;  
 $-\text{SS}(=\text{O})-$ ;  $-\text{OS}(=\text{O})-$ ;  $(-\text{NR})\text{S}(=\text{O})-$ ;  $-\text{SS}(=\text{O})_2-$ ;  $(-\text{S})_2\text{P}(=\text{O})-$ ;  $-(\text{S})\text{P}(=\text{O})-$ ;  $-\text{P}(=\text{O})(-)_2$ ;  
 $(-\text{S})_2\text{P}(=\text{S})-$ ;  $-(\text{S})\text{P}(=\text{S})-$ ;  $-\text{P}(=\text{S})(-)_2$ ;  $(-\text{NR})_2\text{P}(=\text{O})-$ ;  $(-\text{NR})(-\text{S})\text{P}(=\text{O})-$ ;  $(-\text{O})(-\text{NR})\text{P}(=\text{O})-$ ;  
 $(-\text{O})(-\text{S})\text{P}(=\text{O})-$ ;  $(-\text{O})_2\text{P}(=\text{O})-$ ;  $-(\text{O})\text{P}(=\text{O})-$ ;  $-(\text{NR})\text{P}(=\text{O})-$ ;  $(-\text{NR})_2\text{P}(=\text{S})-$ ;  $(-\text{NR})(-\text{S})\text{P}(=\text{S})-$ ;  
 $(-\text{O})(-\text{NR})\text{P}(=\text{S})-$ ;  $(-\text{O})(-\text{S})\text{P}(=\text{S})-$ ;  $(-\text{O})_2\text{P}(=\text{S})-$ ;  $-(\text{O})\text{P}(=\text{S})-$ ; and  $-(\text{NR})\text{P}(=\text{S})-$ ; wherein the  
 atom A, attached to the unsaturated heteroatom E, is attached to the sulfur which in turn is  
 linked via a group G to the silicon atom,

each R is chosen independently from hydrogen, straight, cyclic, or branched alkyl that may or may not contain unsaturation, alkenyl groups, aryl groups, and aralkyl groups, with each R containing from 1 to 18 carbon atoms,

each G is independently a monovalent or polyvalent group derived by substitution of alkyl, alkenyl, aryl, or aralkyl wherein G can contain from 1 to 18 carbon atoms, with the proviso that G is not such that the blocked mercaptosilane would contain an  $\alpha,\beta$ -unsaturated

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carbonyl that can undergo polymerization reactions, and if G is univalent, G can be a hydrogen atom,

X is independently selected from the group consisting of -Cl, -Br, RO-, RC(=O)O-, R<sub>2</sub>C=NO-, R<sub>2</sub>NO-, R<sub>2</sub>N-, -R, and -(OSiR<sub>2</sub>)<sub>i</sub>(OSiR<sub>3</sub>)<sub>j</sub> wherein each R is as above and at least one X is not -R,

p is 0 to 5; r is 1 to 3; z is 0 to 2; q is 0 to 6; a is 0 to 7; b is 1 to 3; j is 0 to 1, but it may be 0 only if p is 1, c is 1 to 6, t is 0 to 5; s is 1 to 3; k is 1 to 2; with the provisos that (I) if A is carbon, sulfur or sulfonyl, then (i) a + b is 2 and (ii) k is 1; (II) if A is phosphorus, then a + b is 3 unless both (i) c is greater than 1 and (ii) b is 1, in which case a is c + 1; and (III) if A is phosphorus, then k is 2, to produce a rubber mixture;

mixing into the rubber mixture (i) a deblocking agent to deblock the blocked mercaptosilane, and (ii) a curing agent; and

allowing the rubber mixture to cure.